EVALUATION OF OSIRIS-REx CONTACT PAD SAMPLERS FOR BENNU SURFACE REGOLITH PARTICLES. M. S. Thompson[1], L. P. Keller[2], Z. Gainsforth[3], C. J. Snead[2], C. A. Dukes[4], B. Rizk[5], E. Cloutis[6], E. H. Blumenfeld[7], J. E. Aebersold[8] , H. C. Connolly Jr.[5,9,10], and D. S. Lauretta[5], [1]Department of Earth, Atmospheric and Planetary Sciences, Purdue University, West Lafayette, IN (mthompson@purdue.edu), [2]ARES, NASA JSC, Houston, TX, [3]Space Sciences Laboratory, University of California at Berkeley, Berkeley, CA, [4]University of Virginia, Charlottesville, VA, [5]Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ, [6]University of Winnipeg, Winnipeg, MB, [7]LZ Technology, JETS Contract, NASA JSC, Houston, TX, [8]JETS at Texas State University, NASA JSC, Houston, TX, [9]Department of Geology, Rowan University, Glassboro, NJ, [10]Department of Earth and Planetary Science, American Museum of Natural History, New York, NY.

Introduction: NASA's Origins, Spectral Interpretation, Resource Identification, and Security–Regolith Explorer (OSIRIS-REx) mission returned material from asteroid Bennu to Earth in September 2023 [1]. In addition to the bulk sample (>70 g), OSIRIS-REx's Touch-and-Go Sample Acquisition Mechanism (TAGSAM) also collected material from Bennu using surface particle collectors, or contact pads. The TAGSAM head has 24 of these circular contact pads evenly distributed around the perimeter (Fig. 1), each ~1.75 cm in diameter and consisting of stainless-steel Velcro-like loops [2]. From their positions on the bottom of the TAGSAM head, the contact pads were intended to collect regolith material from the very surface of Bennu by trapping fine particles (<5 mm) in the Velcro. The science team would then be able to examine individual particles for evidence of surface exposure, particularly the microstructural, chemical, and spectral characteristics of space weathering [3,4]. Here we present an evaluation of the OSIRIS-REx contact pads and the material they returned from Bennu.

Contact Pad Processing: The Advanced Imaging and Visualization of Astromaterials (AIVA) team at NASA Johnson Space Center (JSC) performed nadir and oblique imaging of the contact pads *in situ* on the TAGSAM head in the glovebox. After reviewing these data it was determined that higher magnification images would be beneficial for robustly and unambiguously identifying particles on the pads. The contact pad retaining ring was then removed, revealing additional particles wedged between the contact pads and the ring, which were all containerized by the curation team. Next, each contact pad was removed from the TAGSAM and containerized in the glovebox. The JSC curation team then imaged the containerized contact pads using a Nikon SMZ-18 stereomicroscope and the images were provided to the sample analysis team for evaluation (Fig. 2).

Assessment of Contact Pads: Three team members reviewed each contact pad image. We created a repository of scale bar–tagged images for every particle identified on the contact pads, marking the location (pixel) and size (μm) of each particle observed on each of the 24 pads. In total, over 1500 particles were identified, ranging from ~10 μm to ~900 μm in diameter. The geometry of the contact pads, weld spots, and loop positions contributed to ambiguous particle identifications in some cases, but cross-checking between team members indicate this ambiguity to be a minor factor.

Some particles are trapped in the loops of the contact pad Velcro (Fig. 3a) while others are trapped in the stainless-steel weft at the base of the contact pad (Fig. 3b). The particles assume several different and identifiable categories in both color and morphology. Some particles are subrounded, dark and homogenous in color, and others have mottled textures with heterogeneous colors and angular morphologies (Fig. 3c). Particles have been identified on every contact pad.

We developed a scoring system to evaluate the contact pads and their suitability for fulfilling our science goals, which include both understanding the effects of surface exposure on Bennu material, and how surface material on the contact pads is related to the bulk samples collected by TAGSAM. We prioritized pads with particles trapped in the loops, as we expect these particles to be the most likely candidates to be collected at the surface of Bennu. We also considered particles with diverse colors and morphologies, and particle sizes that would enable planned coordinated analysis. Our scoring system will guide our request for the eventual allocation of six contact pads. Jawin et al. [5] mapped the locations of boulder types at the TAG site which will help constrain the possible source rocks for the trapped particles in the contact pads.

Summary and Conclusions: The contact pad samplers successfully collected material from asteroid Bennu. We have identified particles on all 24 pads ranging in size from 10 μm to nearly 1 mm. The evaluation of the contact pads is underway for eventual allocation of six pads to the sample analysis team.

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References: [1] Lauretta, D. S. et al. (2022) *Science 377*, 285–291. [2] Bierhaus E. B., et al. (2018) *Space Sci. Rev. 214*, 107. [3] Keller L. P. et al. (2024) this vol. [4] Thompson M. S. et al. (2024) this vol. [5] Jawin E. R. et al. (2023) *JGR Planets 128*, e2023JE008019.

Figure 1: Image of the TAGSAM with contact pads before their removal and containerization.

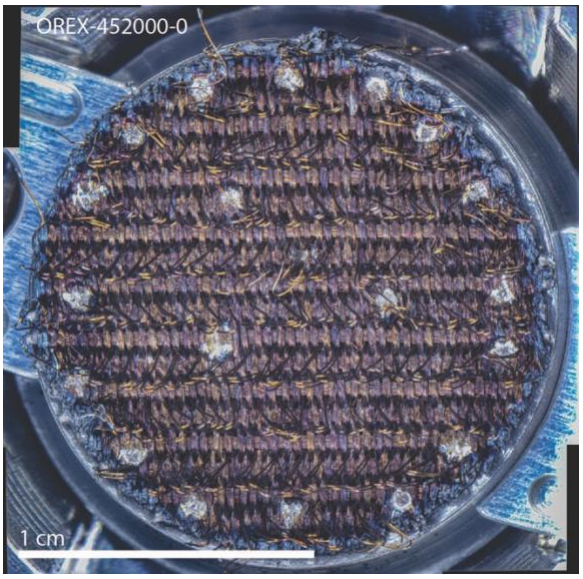

Figure 2: Stereomicroscope image mosaic of contact pad OREX-452000-0.

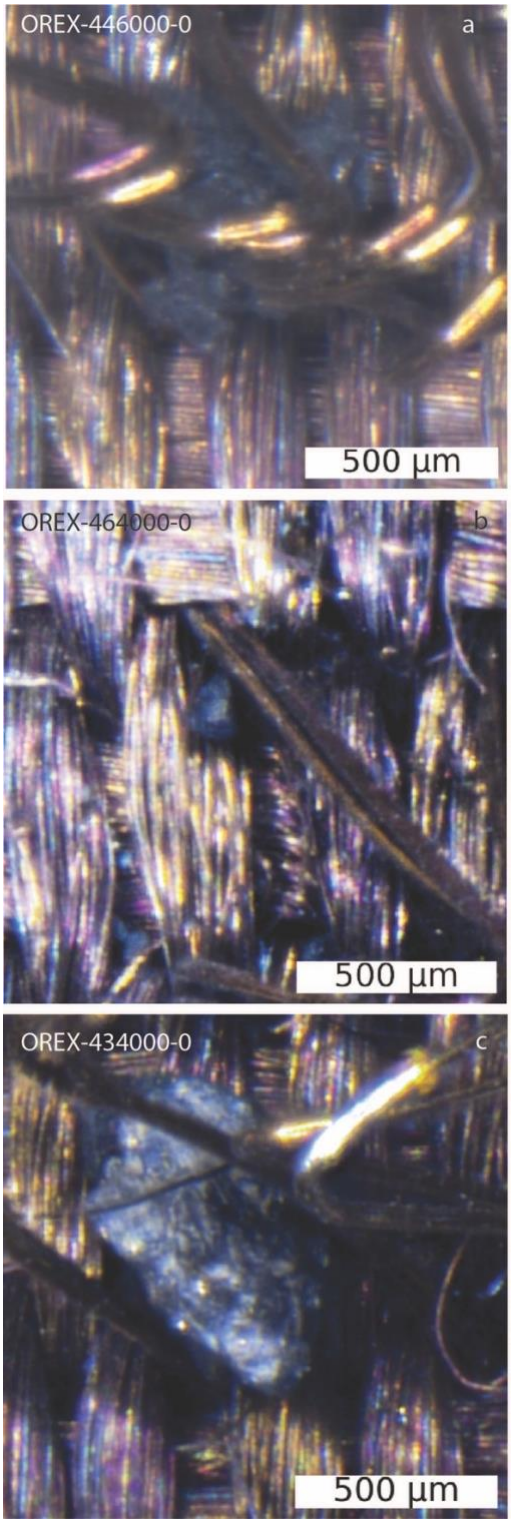

Figure 3: a) Particle trapped in the contact pad loops, b) particle trapped in the weft at the base of the contact pad, and c) particle with angular morphology and mottled, heterogeneous color.